Charging ahead

Introducing the GE WattStation™

July 2010

Electric Vehicles are Coming … and so is the need for electric infrastructure

Current Global Forecasts for EV Charging Stations

-20K installations in 2010

-3MM installations by 2015

Geographical Mix

-54% in USA

-23% in China

-23% ROW (mainly Europe)

Source: ABI Research, April 2010

Federal Government Activity

1. **American Recovery and Reinvestment Act (ARRA) Funding – $2.4B for manufacturing and infrastructure**
   - $1.5B for US-based manufacturers to produce batteries and EV components
   - $500MM to produce other EV components like motors
   - $400MM to demonstrate and evaluate PHEV and related infrastructure
2. **Auto Manufacturer Incentives - $8B loans for Advanced Vehicle Technologies**
   - $5.9B to Ford (factories in Ohio, Illinois, Kentucky, Michigan, Missouri, Ohio)
   - $1.6B to Nissan (factory in Tennessee)
   - $465MM to Telsa (factory in California)
3. **Fuel Efficient Vehicles Tax Incentives for Consumers**
   - Tax credit for EV's, up to $7,500
   - Tax credit for charging stations up to $2,000 or 50% of the cost
   - Final guidance is pending the issuance of EV regulations

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Auto Manufacturer Activity

Battery Electric Vehicles (BEV):

2010 Coda Automotive Sedan
2010 Mitsubishi iMiEV BEV
2010 Nissan LEAF
2010 Ford Battery Electric Van
2010 Tesla Roadster Sport EV
2010 Chevy Volt Extended Range EV

2011 Peugeot Urban EV*
2011 Renault Kangoo Z.E.
2011 Renault Fluence Z.E.
2011 Tesla Model S
2011 BYD e6 Electric Vehicle
2011 Ford Battery Electric Small Car
2011 Opel Ampera Extended Range*

2012 Fiat 500 minicar
2012 Renault City Car*
2012 Renault Urban EV*
2012 Audi e-tron

2013 Volkswagen E-Up*
2016 Tesla EV

Hybrid Electric Vehicles (PHEV):

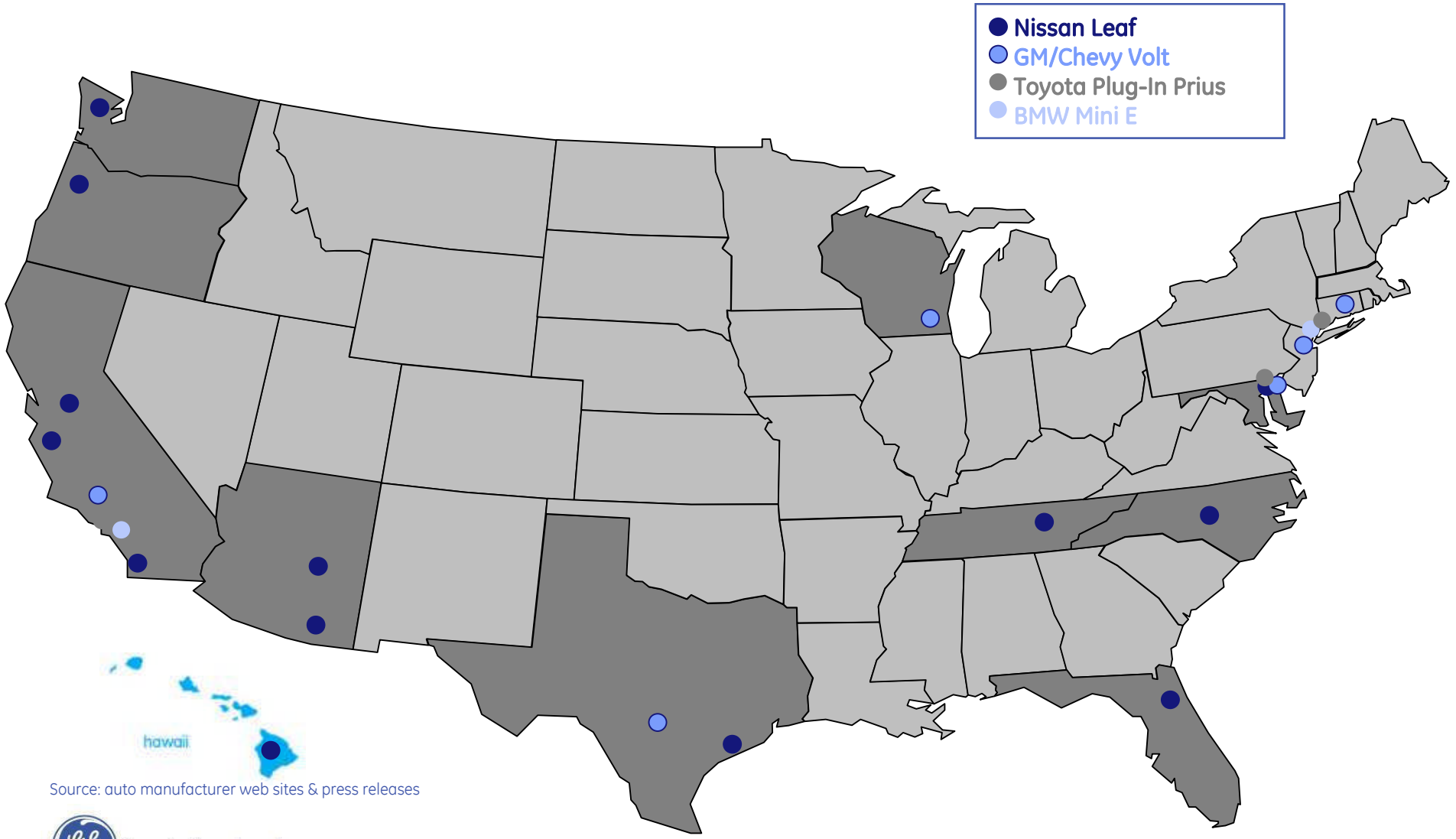
2010 Lexus HS 250h
2010 Mercedes E Class Hybrid
2010 Porsche Cayenne S Hybrid
2010 Toyota Camry Hybrid
2010 Toyota Prius Hybrid

2011 Audi A8 Hybrid (likely introduction)
2011 BMW 5-Series ActiveHybrid
2011 Honda CR-Z sport hybrid coupe
2011 Lexus CT 200h Hybrid Hatchback
2011 Peugeot Diesel Hybrid*
2011 Suzuki Kizashi Hybrid
2011 Audi Q5 Crossover Hybrid
2011 Hyundai Sonata Hybrid
2011 Infiniti M35 Hybrid

2014 Ferrari Hybrid

Source: www.electricdrive.org
*European Launch

Auto Manufacturer Launch Cities



Source: auto manufacturer web sites & press releases

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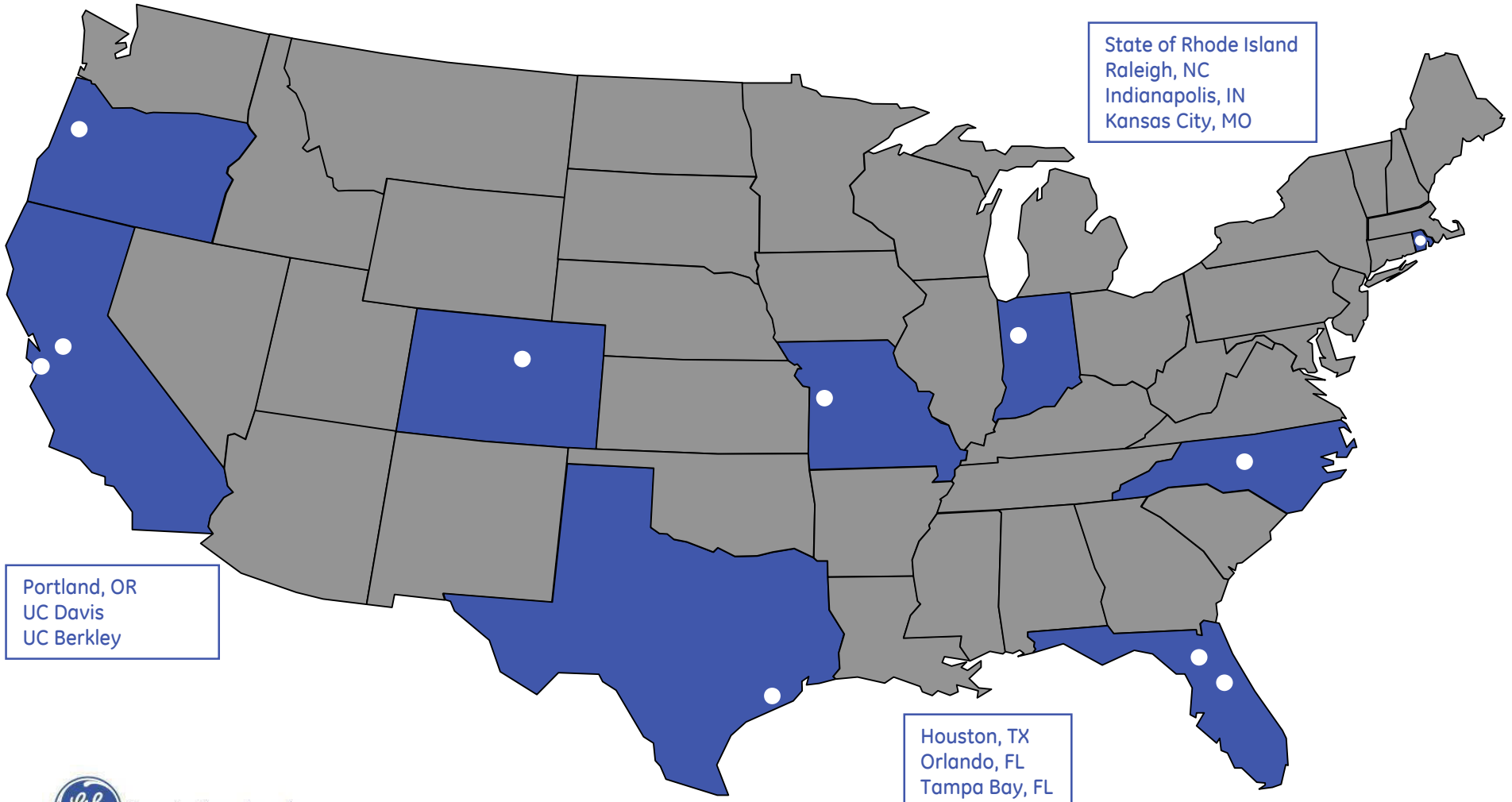
Project Get Ready

- Non-profit initiative led by the Rocky Mountain Institute to prepare cities for EV launch
- GE serving as a technical advisor



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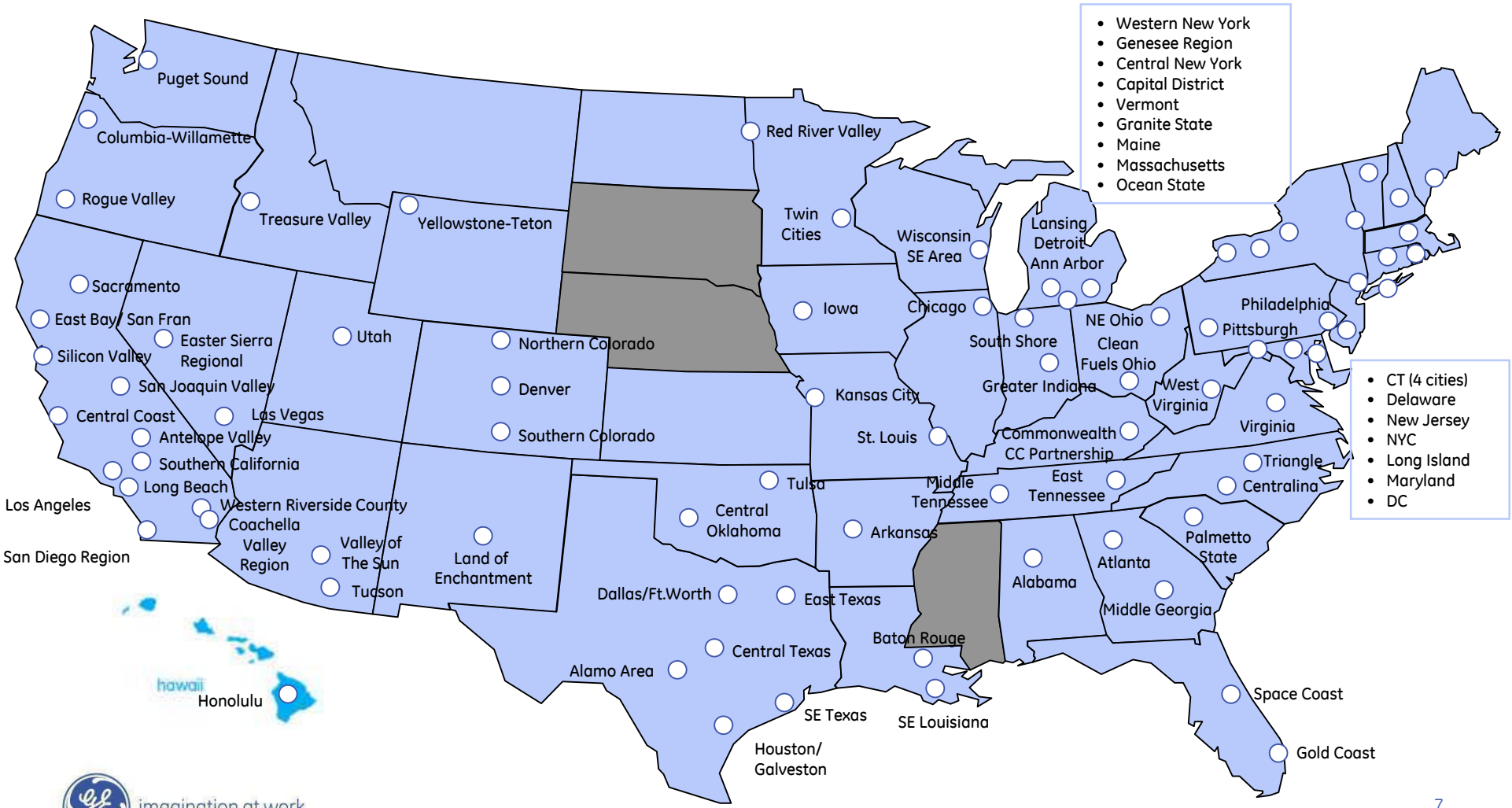
DOE Clean Cities Initiative

- DC-based initiative of the DOE's Office of Energy Efficiency and Renewable Energy
- Over 90 coalitions established with 6,500 stakeholders from both the public and private sectors
- Coalitions supporting various clean technologies, including EV infrastructure



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Electric Vehicle Terminology

Terminology
EVSE: Electric Vehicle Supply Equipment
PHEV: Plug-In Hybrid Electric Vehicles
BEV: Battery Electric Vehicles
EV: Electric Vehicles – generic name for PHEV & BEV

Example: Nissan Leaf
-24 kWh battery
-100 mile range
-Level 1 = 20 hours
-Level 2 = 8 hours
-Level 3 = 30 mins
Source: NissanUSA web site

Level 1 (Slow Charging)

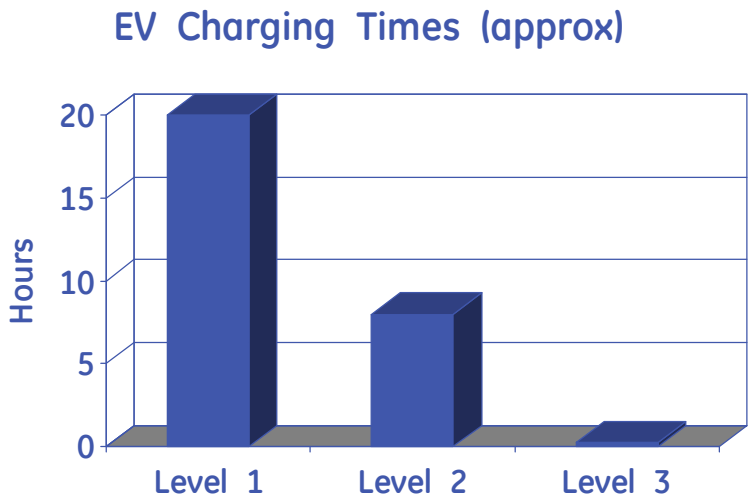
- 120VAC, 15A, compatible with the most commonly available grounded electrical outlet
- Typical charge time: 15-20+ hours

Level 2 (Faster Charging)

- 208-240VAC, up to 80A
- Typical charge time: 4-8 hours

DC Charging

- Typical charge time: 15 - 30 minutes



Note: actual charge time depends on a number of factors

U.S. Electric Vehicle Standards

UL 2594, for EVSE

UL 2594 covers electric vehicle (EV) supply equipment, rated a maximum of 250 V ac, with a frequency of 60 Hz, and intended to provide power to an electric vehicle with an onboard charging unit. The products covered by UL 2594 include EV Power Outlets, EV cord sets and EV charging stations, Level 1 & 2.

UL 2231, the Standard for Safety of Personnel Protection Systems for EV Supply Circuits

This Standard covers devices and systems intended for use in accordance with the National Electrical Code® (American National Standards Institute/National Fire Protection Association 70), to reduce the risk of electric shock to the user from accessible parts, in grounded or isolated circuits for charging EVs.

NEC Article 625, Electric Vehicle Charging System

The provisions of this article cover the electrical conductors and equipment external to an electric vehicle that connect an electric vehicle to a supply of electricity by conductive or inductive means, and the installation of equipment and devices related to electric vehicle charging.

SAE (Society of Automotive Engineers) J1772, Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charge Coupler

This SAE Recommended Practice covers the general physical, electrical, functional and performance requirements to facilitate conductive charging of EV/PHEV vehicles in North America. This document defines a common EV/PHEV and supply equipment vehicle conductive charging method including operational requirements and the functional and dimensional requirements for the vehicle inlet and mating connector.

The new EV charging infrastructure will need to be built in the home, at work, at coffee shops, near shopping malls, hotels and all around town — virtually anywhere we drive and park our vehicles.

Introducing the GE WattStation™

An easy-to-use charger designed by renowned industrial designer Yves Behar

"The GE WattStation achieves this with a welcoming design that is seamlessly integrated in the urban landscape and becomes a natural part of our daily driving routine."

"Good design is when a new technology enters our life and makes it simpler, beautiful and healthy"

GE WattStation™ Specification

GE WattStation will be a modular design that can be upgraded as new technology arrives and customer needs change

Basic:

1. Supply Needs: 208-240VAC @ 32A with 40A overload (2 pole)
2. GF Protection with Ground Monitor (UL 2231)
3. Charger & Vehicle Communication (NEC 625)
   - Connection Interlock
   - Personnel Protection
   - Automatic De-Energizing Device
   - Ventilation Interlock
4. Connection for SAE J1772 Plug & Cord
5. LED Lights & Display
6. Indoor & Outdoor Enclosure (NEMA 4)

Commerce Options:

Card Reader, Card Swipe for Credit Cards

Communication Options:

Open Network Communications – Ethernet CAT5, RS485, RS232

Intelligent Meters for the Smart Grid interface

GE WattStation
Available April '11

GE WattStation™ Specification

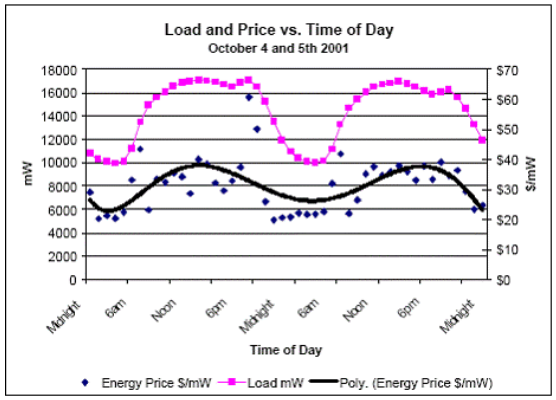
Commerce and Communication Options

Commerce Options

- Major credit card companies
- Card Reader or Card Swipe
- Open to all … no need to subscribe

Communication Options

- Smart metering to enable time of day pricing and manage demand with utilities
- Open network protocols for integration into building management systems
- Maximum flexibility to meet your needs



GE WattStation™ … a closer look

What's inside?
-A contactor
-A 40A switch
-Control boards
-Connectors

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EV Infrastructure is more than just the charging station …

Utility Supply

Utility Transformer

Switchgear

Switchboards
And Panelboards

Sub-metering

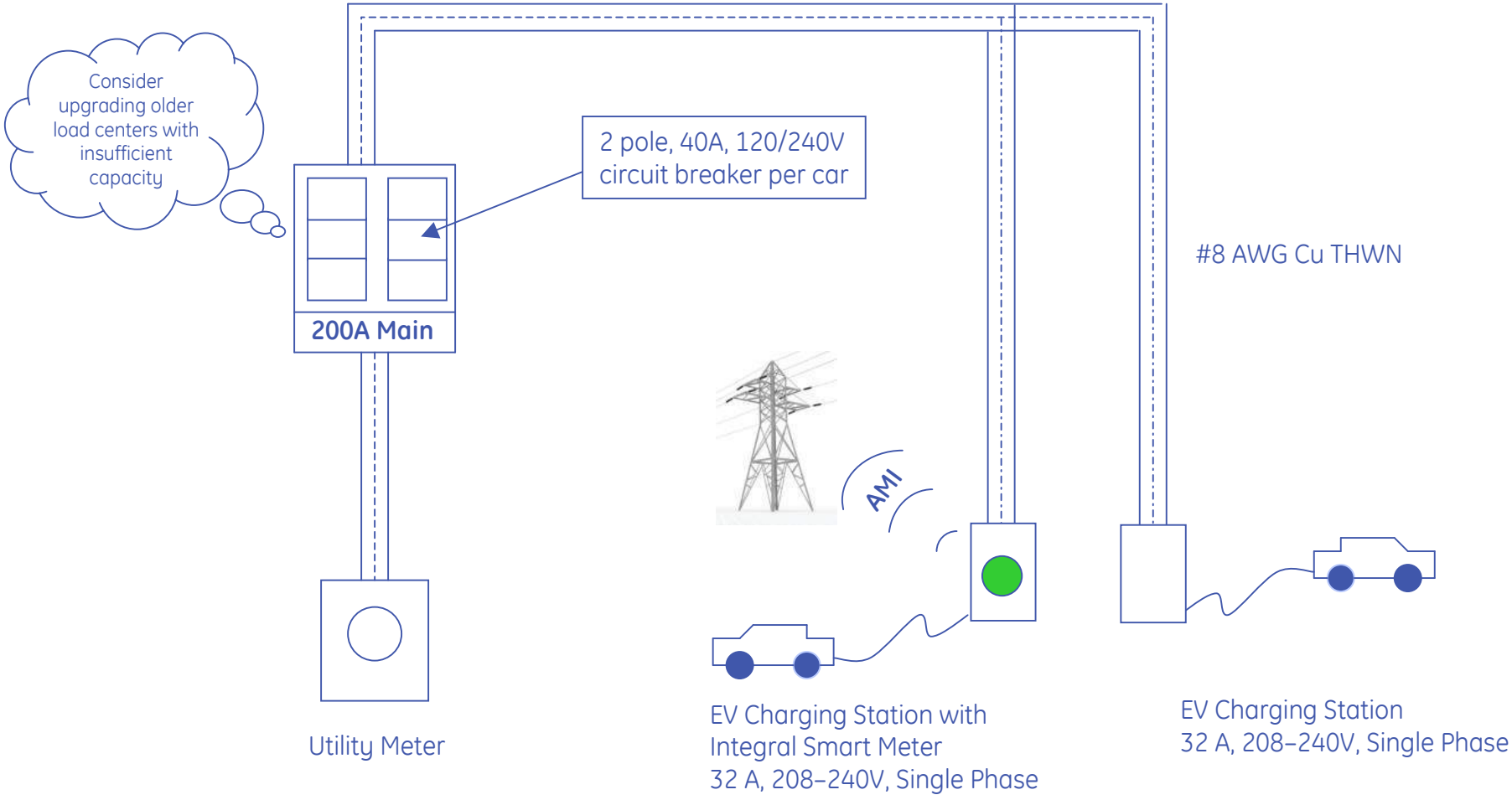
General Purpose
Transformers

Load Centers

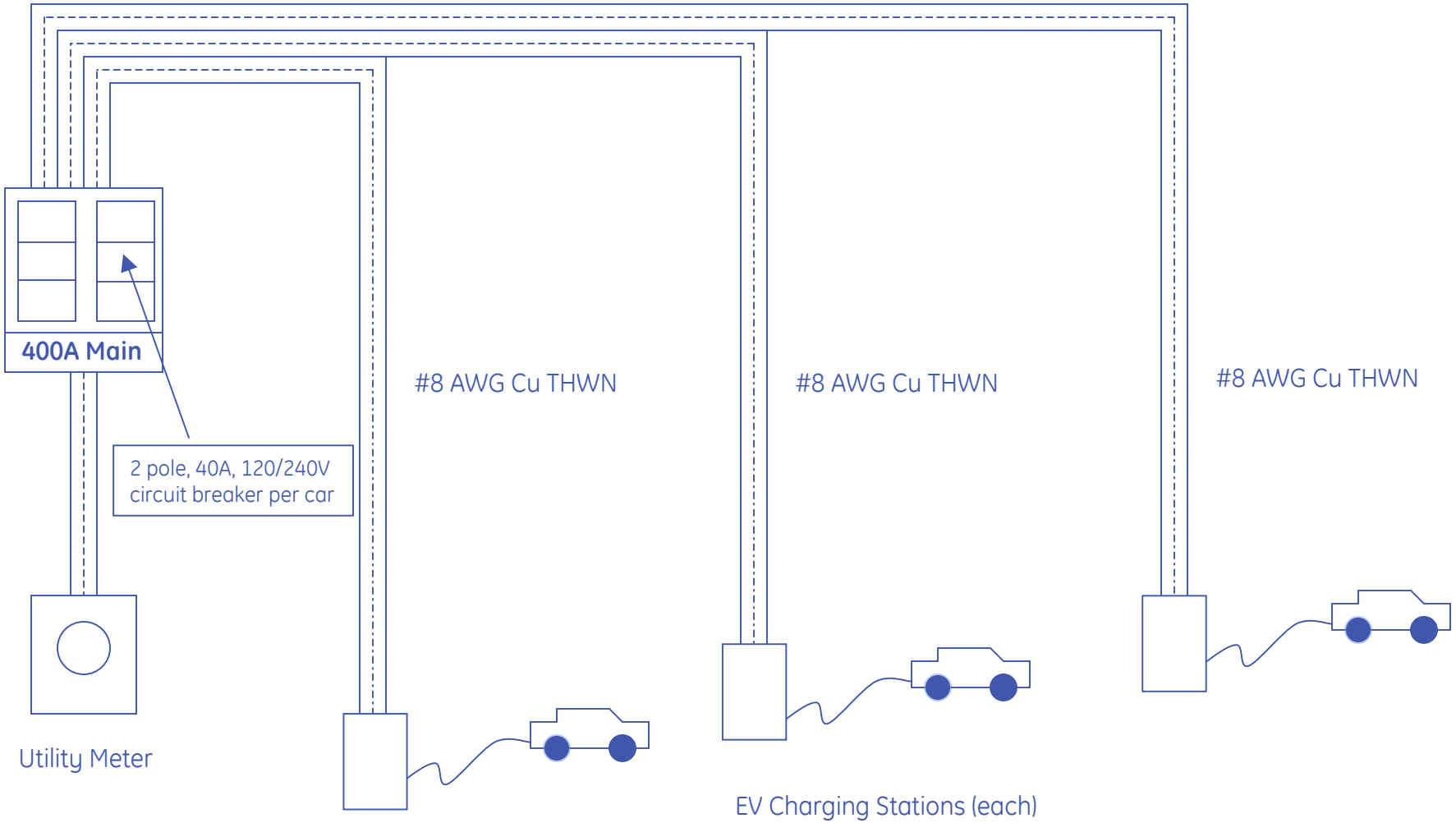
GE WattStation

… for every $1 spent on charging stations, 50c could be spent on infrastructure

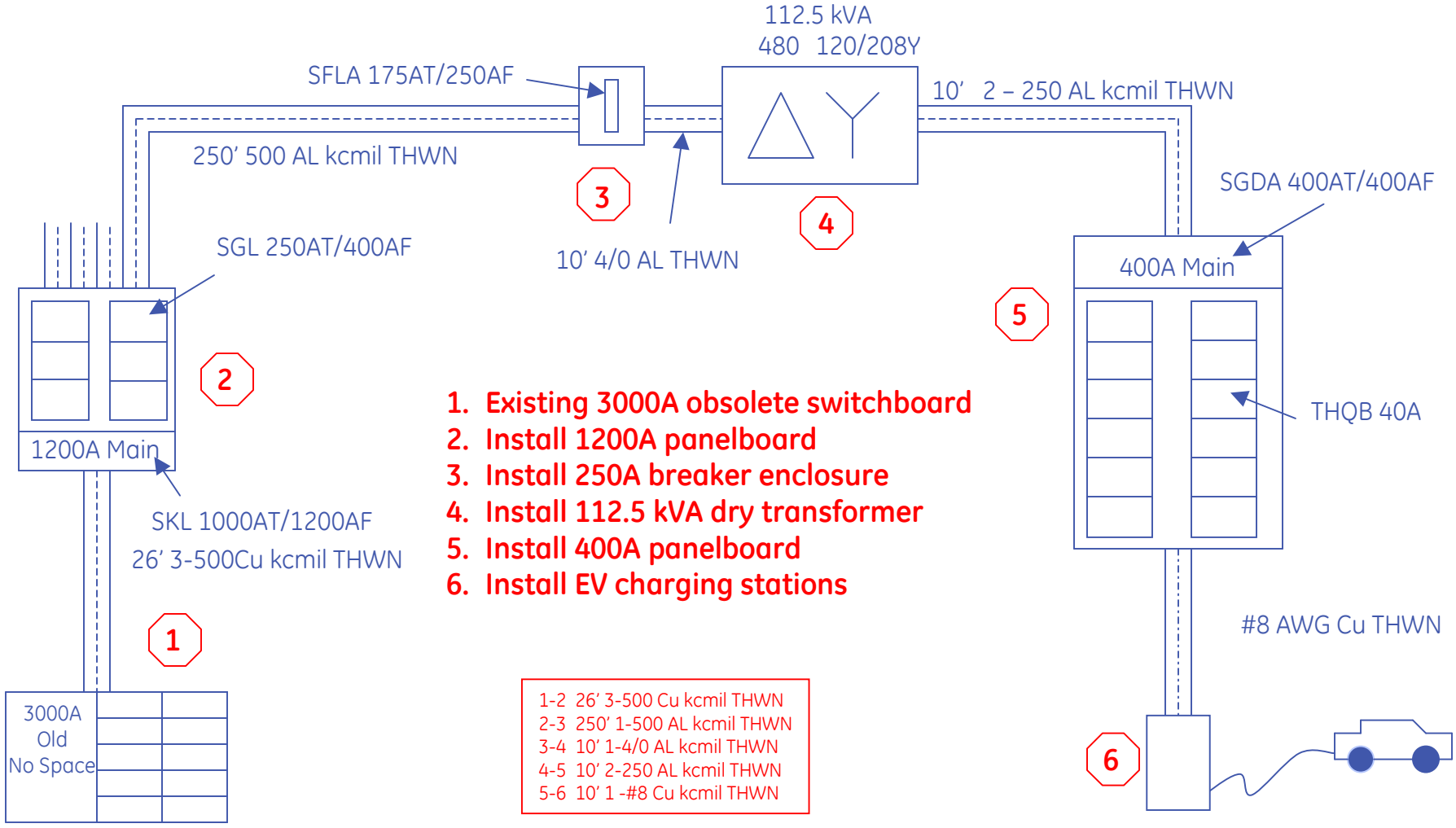
Example 1 – Adding 1 GE WattStation to a single family residence with a 200A service



Example 2 – Adding 3 GE WattStation to a retail outlet with a 400A service



Example 3 – Adding 12-48 GE WattStation to an office building with a 3000A service



1. **Existing 3000A obsolete switchboard**
2. **Install 1200A panelboard**
3. **Install 250A breaker enclosure**
4. **Install 112.5 kVA dry transformer**
5. **Install 400A panelboard**
6. **Install EV charging stations**

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Operating & Environmental Benefits

a product of ecomagination

GE's WattStation™ is an easy-to-use electric vehicle (EV) charger designed to help accelerate the adoption of plug-in electric vehicles (PEV) by significantly decreasing time needed for vehicle charging.

On average the WattStation™ decreases EV charging time from 12-18 hours to as little as 4-8 hours compared to standard charging, assuming a 24 kWh battery and a full-cycle charge.

If 10,000 vehicle owners switched from gas-powered passenger cars to EVs, over 33,000 metric tons of CO2 emissions could be avoided annually.

This is equivalent to the annual CO2 emissions of approximately 6,500 gas-powered passenger cars on U.S. roads.

Assumptions: EVs have a typical 24 kWh battery with 100 mile range, vehicles travel a typical 12,000 miles per year, and the EVs are powered by the average US electricity grid mix.

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LEED Points

LEED-NC: Sustainable Sites Credit 4.3

-3 points available if 5% of parking is made available for low-emission & fuel efficient vehicles

LEED-EB: Sustainable Site Credit 4.0

-3-15 points available for the reduction in conventional commuting trips from 10-75%

For more information on LEED, please visit www.geelectrical.com/energy

Product Availability

[1st Generation – Nov'10]

[GE WattStation™ – 2Q'11]

Things to consider when purchasing or specifying EV charging stations

	GE
1. Is the product certified for UL 2594, UL 2231, and NEC 625?	✓
2. Can the supplier also provide circuit protection devices, transformers and panel-boards to provide a total electrical system?	✓
3. Has the product been designed to be easily upgradeable as new communication options and technology arrives?	✓
4. Do options exist for open communication protocols, non-subscription based commerce, and smart grid interface?	✓
5. Has the charger be designed for ease of use, durability and have the right consumer brand to overcome barriers to adoption?	✓
6. Can the supplier provide project management support? Are they experienced at operating in the electrical industry?	✓
7. What happens if you need spare parts or have a technical question? Does the supplier have 24/7 post sales support?	✓

GE WattStation™ - Charging Ahead

www.geelectrical.com/ev

www.twitter.com/GE_EV_Charging

www.youtube.com/ecomagination

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